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EXAMINER	
WANG, JIN CHENG	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/823,935	Applicant(s) PETERSON ET AL.	
	Examiner Jin-Cheng Wang	Art Unit 2672	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32,37-39,41-61,63-88 and 91-97* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32, 37-39, 41-61, 63-88, 91-97* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendments filed on 01/12/2004 have been entered. Claims 33-36, 40, 62, 89-90 have been canceled. Claims 1-32, 37-39, 41-61, 63-88, 91-97 are pending in the application.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 14-22, 41-48, 52-61, 64-85, 87-88 and 92 are rejected under 35 U.S.C. 102(e) as being anticipated by Wong et al. U.S. Pat. No. 6,501,483 (hereinafter Wong).

3. Claim 14:

Wong teaches a method for generating an image having pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively, comprising:

Calculating pairs of sample values for pixels of the image in accordance with a plurality of sampling patterns, one sampling pattern per pixel, one pair of sampling points per sampling pattern (e.g., column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating a value for at least one pixel of the image from a respective pair or pairs of calculated sample values (e.g., column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-67, column 8, lines 1-5, column 10, lines 23-46).

- The examiner notes that at column 7, lines 54-67 and column 8, lines 1-5, Wong teaches *determining/calculating* the average pixel value from the stored super-sample values in contiguous memory locations, and therefore Wong teaches calculating a value for at least one pixel of the image from a respective pair or pairs of calculated sample values because (S1+S2+S3+S4)/4 = ((S1+S2)/2 + (S3+S4)/2)/2 where S1, S2, S3, S4 are super-sample values. Moreover, Wong also teaches in Fig. 7 determining/calculating object value at the subpixel location. The Examiner asserts that determining object value at the sub-pixel location inherently implies calculating object value at the sub-pixel location.

Claim 15:

The claim 15 encompasses the same scope of invention as that of claim 14 except additional claimed limitation that a first sampling pattern defines sample positions relative to a given pixel on opposite sides of a line parallel to a first axis of the image and dividing the respective pixel in two, and a second sampling pattern defines sample positions relative to a given pixel on opposite sides of a line parallel to a second axis of the image and dividing the respective pixel in two.

However, Wong further discloses the claimed limitation of that a first sampling pattern defines sample positions relative to a given pixel on opposite sides of a line parallel to a first axis of the image and dividing the respective pixel in two, and a second sampling pattern defines sample positions relative to a given pixel on opposite sides of a line parallel to a second axis of the image and dividing the respective pixel in two (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 16:

The claim 16 encompasses the same scope of invention as that of claim 15 except additional claimed limitation that the second sampling pattern comprises a sampling pattern substantially corresponding to the first sampling pattern rotated 90 degree.

However, Wong further discloses the claimed limitation that that the second sampling pattern comprises a sampling pattern substantially corresponding to the first sampling pattern rotated 90 degree (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 17:

The claim 17 encompasses the same scope of invention as that of claim 15 except additional claimed limitation that the sampling patterns alternate per pixel along at least one row or column of pixels.

However, Wong further discloses the claimed limitation that the sampling patterns alternate per pixel along at least one row or column of pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 18:

The claim 18 encompasses the same scope of invention as that of claim 15 except additional claimed limitation that each of the two sampling patterns is applied to every other pixel along at least one row or column of pixels, the second sampling pattern substantially corresponding to the first sampling pattern rotated 90 degrees.

However, Wong further discloses the claimed limitation that each of the two sampling patterns is applied to every other pixel along at least one row or column of pixels, the second sampling pattern substantially corresponding to the first sampling pattern rotated 90 degrees (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 19:

The claim 19 encompasses the same scope of invention as that of claim 15 except additional claimed limitation that the sampling pattern for each consecutive pixel alternates along a row or column of pixels between a given sampling pattern and its 90 degrees-rotated counterpart.

However, Wong further discloses the claimed limitation that the sampling pattern for each consecutive pixel alternates along a row or column of pixels between a given sampling pattern and its 90 degrees-rotated counterpart (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 20:

The claim 20 encompasses the same scope of invention as that of claim 15 except additional claimed limitation that all sampling patterns are considered as dividing the regions of respective pixels into the same four-by-four array of sub-regions and four potential sample

positions are arranged within the array in a manner whereby no two potential sample positions are located in the same row, column, or diagonal of sub-regions, the plurality of sampling patterns comprising first and second sampling patterns, each defining two sampling positions from the four potential sampling positions, the first sampling pattern having sample locations in the first and fourth rows of the array and the second sampling pattern having sample locations in the second and third rows of the array.

However, Wong further discloses the claimed limitation that all sampling patterns are considered as dividing the regions of respective pixels into the same four-by-four array of sub-regions and four potential sample positions are arranged within the array in a manner whereby no two potential sample positions are located in the same row, column, or diagonal of sub-regions, the plurality of sampling patterns comprising first and second sampling patterns, each defining two sampling positions from the four potential sampling positions, the first sampling pattern having sample locations in the first and fourth rows of the array and the second sampling pattern having sample locations in the second and third rows of the array (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 21:

The claim 21 encompasses the same scope of invention as that of claim 14 except additional claimed limitation of the sampling pattern alternating per pixel along at least one row or column of pixels. However, Wong further discloses the claimed limitation of the sampling pattern alternating per pixel along at least one row or column of pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 22:

The claim 22 encompasses the same scope of invention as that of claim 14 except additional claimed limitation of each of the two sampling patterns being applied to every other pixel along at least one row or column of pixels, the second sampling pattern substantially corresponding to the first sampling pattern rotated 90 degrees. However, Wong further discloses the claimed limitation of each of the two sampling patterns being applied to every other pixel along at least one row or column of pixels, the second sampling pattern substantially corresponding to the first sampling pattern rotated 90 degrees (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 41:

Wong teaches a method for calculating values for pixels of an image having its pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with one or more sample patterns, the region of potential sampling locations relative to a pixel considered as divided evenly into a four-by-four array of sub-regions each sampling pattern having at least two sample locations relative to a pixel, each sample location located at one of four candidate sampling locations, and the candidate sampling locations arranged in a manner whereby no two of the four candidate sample locations for a given sampling pattern are located along the same row, column, or diagonal of sub-regions, at least one sampling pattern including at least one other sampling location not located in one of the candidate sampling locations, no more than seven sub-regions

containing any sampling location (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating values for pixels of the image from sample values calculated from respective pixels (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

4. Claim 42:

Wong teaches a method for calculating values for pixels of an image having its pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with a sample pattern, the region of potential sampling locations relative to a pixel considered as divided evenly into a four-by-four array of sub-regions, the sampling pattern having two sample locations relative to a pixel, each sample location located at one of four candidate sampling locations, and the candidate sampling locations arranged in a manner whereby no two of the four candidate sample locations for a given sampling pattern are located along the same row, column, or diagonal of sub-regions (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating values for pixels of the image from sample values calculated from respective pixels (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

Claim 43:

The claim 43 encompasses the same scope of invention as that of claim 42 except additional claimed limitation of the two sample locations located in the first and fourth rows of the array of sub-regions.

However, Wong further discloses the claimed limitation of the two sample locations located in the first and fourth rows of the array of sub-regions (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 44:

The claim 44 encompasses the same scope of invention as that of claim 43 except additional claimed limitation of the two sample locations located substantially at the center of respective sub-regions. However, Wong further discloses the claimed limitation of the two sample locations located substantially at the center of respective sub-regions (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 45:

The claim 45 encompasses the same scope of invention as that of claim 43 except additional claimed limitation of the two sample locations located at the center of respective sub-regions. However, Wong further discloses the claimed limitation of the two sample locations located at the center of respective sub-regions (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 46:

The claim 46 encompasses the same scope of invention as that of claim 42 except additional claimed limitation of the two sample locations located in the second and third rows of the array of sub-regions. However, Wong further discloses the claimed limitation of the two sample locations located in the second and third rows of the array of sub-regions (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 47:

The claim 47 encompasses the same scope of invention as that of claim 446 except additional claimed limitation of the two sample locations located substantially at the center of respective sub-regions. However, Wong further discloses the claimed limitation of the two sample locations located substantially at the center of respective sub-regions (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 48:

The claim 48 encompasses the same scope of invention as that of claim 46 except additional claimed limitation of the two sample locations located at the center of respective sub-regions. However, Wong further discloses the claimed limitation of the two sample locations located at the center of respective sub-regions (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

5. Claim 52:

U.S. Pat. No. 6,501,483 to Wong et al. teaches a method for calculating values for pixels of an image having pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with a plurality of sample patterns (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating values for pixels of the image from respective calculated sample values (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

Claim 53:

The claim 53 encompasses the same scope of invention as that of claim 52 except additional claimed limitation of the plurality of sampling patterns comprising a set of addressable sampling patterns stored in a writable memory. However, Wong further discloses the claimed limitation of the plurality of sampling patterns comprising a set of addressable sampling patterns stored in a writable memory (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 54:

The claim 54 encompasses the same scope of invention as that of claim 52 except additional claimed limitation of the sampling pattern for a given pixel being determined by a calculation based upon the row and/or column containing the pixel. However, Wong further

discloses the claimed limitation of the sampling pattern for a given pixel being determined by a calculation based upon the row and/or column containing the pixel (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 55:

The claim 55 encompasses the same scope of invention as that of claim 52 except additional claimed limitation of determination of the sample locations comprising each sampling pattern based on a deterministic calculation. However, Wong further discloses the claimed limitation of determination of the sample locations comprising each sampling pattern based on a deterministic calculation (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 56:

The claim 56 encompasses the same scope of invention as that of claim 53 except additional claimed limitation of selecting one sampling pattern from the plurality of sampling patterns to be applied when calculating sample values for a given pixel. However, Wong further discloses the claimed limitation of selecting one sampling pattern from the plurality of sampling patterns to be applied when calculating sample values for a given pixel (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 57:

The claim 57 encompasses the same scope of invention as that of claim 56 except additional claimed limitation of selecting the one sampling pattern comprising randomly selecting one sampling pattern from the plurality. However, Wong further discloses the claimed limitation of selecting the one sampling pattern comprising randomly selecting one sampling pattern from the plurality (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 58:

The claim 58 encompasses the same scope of invention as that of claim 56 except additional claimed limitation that selection of the one sampling pattern is made in accordance with a pseudo-random selection method. However, Wong further discloses the claimed limitation that selection of the one sampling pattern is made in accordance with a pseudo-random selection method (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 59:

The claim 59 encompasses the same scope of invention as that of claim 56 except additional claimed limitation that selection of the one sampling pattern is made based on the sampling patterns selected for calculating sample values for pixels in the same row or column as the given pixel.

However, Wong further discloses the claimed limitation that selection of the one sampling pattern is made based on the sampling patterns selected for calculating sample values for pixels in the same row or column as the given pixel (figures 1-7, column 4, lines 14-65,

column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 60:

The claim 60 encompasses the same scope of invention as that of claim 56 except additional claimed limitation that selection of the one sampling pattern is made based on the row and/or column in which the given pixel lies. However, Wong further discloses the claimed limitation that selection of the one sampling pattern is made based on the row and/or column in which the given pixel lies (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 61:

The claim 61 encompasses the same scope of invention as that of claim 60 except additional claimed limitation that the sampling patterns define sampling locations substantially at the center of one or more of sixteen different regions, the sixteen regions evenly arranged in a four-by-four array of regions, each of the regions having the same shape and size.

However, Wong further discloses the claimed limitation that the sampling patterns define sampling locations substantially at the center of one or more of sixteen different regions, the sixteen regions evenly arranged in a four-by-four array of regions, each of the regions having the same shape and size (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 64:

(1) Wong teaches a method for calculating values for pixels of an image having pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with a fixed set of sampling patterns stored in a read-only memory, selecting one sampling pattern from the set of sampling patterns to be applied for calculating sample values for a given pixel (it is apparent that sampling patterns to be stored in a read-only memory; see a plurality of sampling patterns in figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating values for pixels of the image from respective calculated sample values (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

Claim 65:

The claim 65 encompasses the same scope of invention as that of claim 64 except additional claimed limitation of selecting one sampling pattern comprising randomly selecting one sampling pattern from the set. Wong further discloses the claimed limitation of selecting one sampling pattern comprising randomly selecting one sampling pattern from the set (column 7, lines 18-53).

Claim 66:

The claim 66 encompasses the same scope of invention as that of claim 64 except additional claimed limitation that selection of the one sampling pattern is made in accordance

with a pseudo-random selection method. Wong further discloses the claimed limitation that selection of the one sampling pattern is made in accordance with a pseudo-random selection method (column 7, lines 18-53).

Claim 67:

The claim 67 encompasses the same scope of invention as that of claim 64 except additional claimed limitation that selection of the one sampling pattern is made based on the sampling patterns selected from calculating sample values for pixels in the same row or column as the given pixel. Wong further discloses the claimed limitation that selection of the one sampling pattern is made based on the sampling patterns selected from calculating sample values for pixels in the same row or column as the given pixel (column 7, lines 18-53).

Claim 68:

The claim 68 encompasses the same scope of invention as that of claim 64 except additional claimed limitation that selection of the one sampling pattern is made based on the row and/or column in which the given pixel lies. Wong further discloses the claimed limitation that selection of the one sampling pattern is made based on the row and/or column in which the given pixel lies (column 7, lines 18-53).

Claim 69:

The claim 69 encompasses the same scope of invention as that of claim 68 except additional claimed limitation that the sampling patterns define sampling locations substantially at the center of one or more of sixteen different regions, the sixteen regions evenly arranged in a four-by-four array of regions, each region having the same shape and size.

Wong further discloses the claimed limitation that selection that the sampling patterns define sampling locations substantially at the center of one or more of sixteen different regions, the sixteen regions evenly arranged in a four-by-four array of regions, each region having the same shape and size (column 7, lines 18-53).

6. Claim 70:

Wong teaches a method for calculating values for pixels of an image having the pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Shifting the sampling locations defined by one or more sampling patterns relative to a pixel (column 7, lines 1-17);

Calculating sample values for at least one pixel in accordance with the shifted sampling locations of a respective sampling pattern (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating values for pixels of the image from respective calculated sample values (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

Claim 71:

The claim 71 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that the one or more sampling patterns are stored into a writable memory, the sampling pattern applied depending upon those stored in the memory.

Wong further discloses the claimed limitation that selection that the one or more sampling patterns are stored into a writable memory, the sampling pattern applied depending upon those stored in the memory (column 7, lines 18-53).

Claim 72:

The claim 72 encompasses the same scope of invention as that of claim 71 except additional claimed limitation that shifting sampling locations for a sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each respective sampling location for each pixel.

Wong further discloses the claimed limitation that shifting sampling locations for a sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each respective sampling location for each pixel (column 7, lines 1-53).

Claim 73:

The claim 73 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that shifting the sampling locations of a sampling pattern comprises applying a linear transformation to the coordinates of the sampling locations of the sampling pattern.

Wong further discloses the claimed limitation that shifting the sampling locations of a sampling pattern comprises applying a linear transformation to the coordinates of the sampling locations of the sampling pattern (column 7, lines 1-53).

Claim 74:

The claim 74 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that shifting the sampling locations of a sampling pattern comprises

adding independently random or pseudorandom offset to each coordinate of each respective sampling location for each pixel.

Wong further discloses the claimed limitation that shifting the sampling locations of a sampling pattern comprises adding independently random or pseudorandom offset to each coordinate of each respective sampling location for each pixel (column 7, lines 1-53).

Claim 75:

The claim 75 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that shifting the sampling pattern comprises shifting the sampling pattern parallel to either the first or second axis.

Wong further discloses the claimed limitation that shifting the sampling pattern comprises shifting the sampling pattern parallel to either the first or second axis (column 7, lines 1-53).

Claim 76:

The claim 76 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that at least one of the sampling patterns comprises a sampling pattern having four sample locations, the four sample locations arranged relative to a pixel within a region evenly divided into an array of 16 sub-regions in a manner whereby no two sample locations are located in the same row, column, or diagonal of sub-regions where the sub-regions are considered as arranged into a four-by-four array of sub-regions.

Wong further discloses the claimed limitation that at least one of the sampling patterns comprises a sampling pattern having four sample locations, the four sample locations arranged relative to a pixel within a region evenly divided into an array of 16 sub-regions in a manner

whereby no two sample locations are located in the same row, column, or diagonal of sub-regions where the sub-regions are considered as arranged into a four-by-four array of sub-regions (column 7, lines 1-53).

Claim 77:

The claim 77 encompasses the same scope of invention as that of claim 76 except additional claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the four sample locations for each pixel.

Wong further discloses the claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the four sample locations for each pixel (column 7, lines 1-53).

Claim 78:

The claim 78 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that at least two of the sampling patterns is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row, column, or diagonal of sub-pixels, each of the two sampling patterns having two sampling positions from the four potential sampling positions, a first sampling pattern having sample locations in the first and fourth rows of the array and a second sampling pattern having sample locations in the second and third rows of the array.

Wong further discloses the claimed limitation that at least two of the sampling patterns is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential

sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row, column, or diagonal of sub-pixels, each of the two sampling patterns having two sampling positions from the four potential sampling positions, a first sampling pattern having sample locations in the first and fourth rows of the array and a second sampling pattern having sample locations in the second and third rows of the array (column 7, lines 1-53).

Claim 79:

The claim 79 encompasses the same scope of invention as that of claim 78 except additional claimed limitation that shifting sampling locations for the two sampling patterns comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel.

Wong further discloses the claimed limitation that shifting sampling locations for the two sampling patterns comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel (column 7, lines 1-53).

Claim 80:

The claim 80 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that one sampling pattern is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row, column, or diagonal of sub-pixels, the sampling pattern having two sampling positions from the four potential sampling positions, the sampling pattern having sample locations in the first and fourth rows of the array.

Wong further discloses the claimed limitation that one sampling pattern is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row, column, or diagonal of sub-pixels, the sampling pattern having two sampling positions from the four potential sampling positions, the sampling pattern having sample locations in the first and fourth rows of the array (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

Claim 81:

The claim 81 encompasses the same scope of invention as that of claim 80 except additional claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel.

Wong further discloses the claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel (column 7, lines 1-53).

Claim 82:

The claim 82 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that one sampling pattern is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row, column, or diagonal of sub-pixels, the sampling pattern having two sampling positions from the

four potential sampling positions, the sampling pattern having sample locations in the second and third rows of the array.

Wong further discloses the claimed limitation that one sampling pattern is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row, column, or diagonal of sub-pixels, the sampling pattern having two sampling positions from the four potential sampling positions, the sampling pattern having sample locations in the second and third rows of the array (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

Claim 83:

The claim 83 encompasses the same scope of invention as that of claim 82 except additional claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel.

Wong further discloses the claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel (column 7, lines 1-53).

Claim 84:

The claim 84 encompasses the same scope of invention as that of claim 70 except additional claimed limitation that one sampling pattern is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row,

column, or diagonal of sub-pixels, the sampling pattern having two sampling positions from the four potential sampling positions.

Wong further discloses the claimed limitation that one sampling pattern is considered as dividing a given pixel into a four-by-four array of sub-pixels and four potential sample positions are arranged within the array in a manner where no two potential samples positions are located in the same row, column, or diagonal of sub-pixels, the sampling pattern having two sampling positions from the four potential sampling positions (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

Claim 85:

The claim 85 encompasses the same scope of invention as that of claim 84 except additional claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel.

Wong further discloses the claimed limitation that shifting sampling locations for the sampling pattern comprises adding an independently random or pseudorandom offset to each coordinate of each of the two respective sample locations for each pixel (column 7, lines 1-53).

7. Claims 87-88:

The claim 87(88) encompasses the same scope of invention as set forth in claim 14(20) except additional claimed limitation of an apparatus for rendering of an image. However, Wong further discloses the claimed limitation of an apparatus for rendering of an image (column 3, lines 41-63).

8. Claim 92:

The claim 92 encompasses the same scope of invention as set forth in claim 20 except additional claimed limitation of an apparatus for rendering of an image. However, Wong further discloses the claimed limitation of an apparatus for rendering of an image (column 3, lines 41-63).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-13, 23-32, 37-39, 49-51, 63 86, 91 and 93-97 are rejected under 35 U.S.C. 103(a) as being anticipated by Wong et al. U.S. Pat. No. 6,501,483 (hereinafter Wong) in view of Don P. Mitchell, "Generating Antialiased Images at Low Sampling Densities", Computer Graphics, Vol. 21, No. 4, July 1987, pp. 65-72 (hereinafter Mitchell) and Mark A. Z. Dippe et al. "Antialiasing Through Stochastic Sampling", SIGGRAPH, Vol. 19, No. 3, 1985, pp. 69-78 (hereinafter Dippe).

11. Claim 1:

(1) Wong teaches a method for calculating values for pixels of an image, comprising:

Calculating sample values for pixels of an image in accordance with a sampling pattern for each pixel (column 4, lines 14-30), each sampling pattern defining one or more sampling

locations at which sample values are calculated (figures 5A-5L), the sampling locations being relative to a pixel (figure 5A-5L); and

Determining a value for at least one pixel by combining sample values calculated for the sampling locations for the pixel (column 4, lines 14-65).

- The examiner notes that at the block 542 of Fig. 7, Wong teaches selecting a sampling pattern from a plurality of sampling patterns shown in figures 5A-5L, and based on the super-sample pattern utilized, the location of the sub-pixel associated with each super-sample is determined according to the pattern shown in figures 5A-5L.

(2) However, Wong is silent to the claim limitation of "the sampling pattern for consecutive pixels alternating between a first and a second sampling pattern".

(3) Mitchell teaches a non-uniform or adaptive sampling patterns with variations in local sampling densities for super-sampling cells or pixel regions or pixels (e.g., Mitchell page 67-68).

To illustrate how Mitchell's teaching can be used to construct the sampling pattern for consecutive pixels alternating between a first and a second sampling pattern, the Examiner wishes to explain in more detail. Mitchell discloses each new sampling location is generated if it falls outside a certain distance of any previously chosen sampling locations in super-sampling (Mitchell page 66) and an offset can be added to the sample positions to generate new sampling pattern (Mitchell page 66). Mitchell further discloses a reconstruction filter which determines the number and locations of the sampling points and thereby determines the sampling pattern for each pixel because the filter kernel is pixel position and sampling location dependent and the

filter kernel can be constructed as an alternating function such as a sinc filter with a Hamming window (Mitchell page 67). Mitchell teaches the sampling density can be constructed to alternately change with respect to pixel positions in a way that can be determined by the filter kernel function of the pixel position or sample location and therefore alternately varying with respect to the consecutive pixel positions. Finally, by using the sampling location selection scheme or by using the alternating filter kernel, Mitchell's teaching may generate varying sampling densities such as the sampling pattern for consecutive pixels alternating between a first and a second sampling pattern.

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Mitchell's non-uniform or adaptive sampling for super-sampling cells into the Wong's invention to select sampling patterns for pixels because Wong also teaches non-uniform sampling patterns and non-uniform pixel changes and further teaches that the determination of the appropriate super-sampling pattern to use is somewhat subjective (e.g., Wong column 5, lines 49-67) and therefore suggesting two different sampling patterns can be selected for consecutive pixels. Moreover, while it is known to one of the ordinary skill in the art that super-sampling yields less aliasing, however, Applicant apparently fails to establish the criticality of the specific way of non-uniform or adaptive sampling using two different sampling patterns for consecutive pixels.

(5) One having the ordinary skill in the art would have been motivated to do this because it would have provided a routine experimentation of the test sampling patterns to possibly reduce visible or invisible aliasing noise or to reduce signal to noise ratio by employing the alternating sampling patterns for the consecutive pixels (e.g., Mitchell page 66-68, Dippe page 73-74).

Claim 2:

The claim 2 encompasses the same scope of invention as that of claim 1 except additional claimed limitation that each sampling pattern defines two sample locations and calculating sample values comprises calculating a pair of sample values whenever sample values for a pixel are calculated in accordance with the first or second sampling pattern, the sampling patterns alternating from one pixel to the next. However, Wong further discloses the claimed limitation that each sampling pattern defines two sample locations and calculating sample values comprises calculating a pair of sample values whenever sample values for a pixel are calculated in accordance with the first or second sampling pattern, the sampling patterns alternating from one pixel to the next (figure 1, column 4, lines 14-65, column 10, lines 23-37).

Claim 3:

The claim 3 encompasses the same scope of invention as that of claim 2 except additional claimed limitation that the pixels of the image are arranged along rows and columns parallel to first and second perpendicular axes, respectively, and the pair of sample locations per sampling pattern for at least two pixels are arranged along a line parallel to neither axis.

However, Wong further discloses the claimed limitation that the pixels that the image are arranged along rows and columns parallel to first and second perpendicular axes, respectively, and the pair of sample locations per sampling pattern for at least two pixels are arranged along a line parallel to neither axis (figure 1, column 4, lines 14-65, column 10, lines 23-37).

Claim 4:

The claim 4 encompasses the same scope of invention as that of claim 2 except additional claimed limitation of calculating a pair of sample values comprises calculating sample values at

sample positions arranged according to either a first or second sample pattern, the first sampling pattern having sample positions on opposite sides of a line parallel to a first axis and dividing a respective pixel region in two, and the second sampling pattern having sample positions on opposite sides of a line parallel to a second axis and dividing a respective pixel region in two, the second axis perpendicular to the first axis.

However, Wong further discloses the claimed limitation that the pixels of calculating a pair of sample values comprises calculating sample values at sample positions arranged according to either a first or second sample pattern, the first sampling pattern having sample positions on opposite sides of a line parallel to a first axis and dividing a respective pixel region in two, and the second sampling pattern having sample positions on opposite sides of a line parallel to a second axis and dividing a respective pixel region in two, the second axis perpendicular to the first axis (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 5:

The claim 5 encompasses the same scope of invention as that of claim 4 except additional claimed limitation of the two lines parallel to the respective axes pass through the centers of respective pixels. However, Wong further discloses the claimed limitation that the pixels of the two lines parallel to the respective axes pass through the centers of respective pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 6:

The claim 6 encompasses the same scope of invention as that of claim 5 except additional claimed limitation that each sampling pattern has a sample position on each side of both of two

lines parallel to respective axes and passing through the center of respective pixels. However, Wong further discloses the claimed limitation that each sampling pattern has a sample position on each side of both of two lines parallel to respective axes and passing through the center of respective pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 7:

The claim 7 encompasses the same scope of invention as that of claim 1 except additional claimed limitation that calculating sample values comprises calculating four sample values at four respective sample locations within a respective pixel region whenever a sampling pattern is applied to a pixel, each pixel region considered as divided evenly into a four-by-four array of sub-regions and the four sample locations defined for a pixel by any given sampling pattern arranged within the pixel region in a manner whereby no two sample points defined by the same sampling pattern are located in the same row or column of sub-regions.

However, Wong further discloses the claimed limitation that calculating sample values comprises calculating four sample values at four respective sample locations within a respective pixel region whenever a sampling pattern is applied to a pixel, each pixel region considered as divided evenly into a four-by-four array of sub-regions and the four sample locations defined for a pixel by any given sampling pattern arranged within the pixel region in a manner whereby no two sample points defined by the same sampling pattern are located in the same row or column of sub-regions (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 8:

The claim 8 encompasses the same scope of invention as that of claim 7 except additional claimed limitation of no two sampling locations of the four defined by a given sampling pattern being located in the same row or column or diagonal of sub-regions.

However, Wong further discloses the claimed limitation of no two sampling locations of the four defined by a given sampling pattern being located in the same row or column or diagonal of sub-regions (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 9:

The claim 9 encompasses the same scope of invention as that of claim 8 except additional claimed limitation of each sampling location lying substantially at the center of a sub-region. However, Wong further discloses the claimed limitation of no two sampling locations of each sampling location lying substantially at the center of a sub-region (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 10:

The claim 10 encompasses the same scope of invention as that of claim 8 except additional claimed limitation that no two different sampling patterns applied to two different pixels define any two sampling locations which lie in corresponding sub-regions of their respective pixels.

However, Wong further discloses the claimed limitation that no two different sampling patterns applied to two different pixels define any two sampling locations which lie in corresponding sub-regions of their respective pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 11:

The claim 11 encompasses the same scope of invention as that of claim 10 except additional claimed limitation of the sampling patterns alternating per pixel for vertically-consecutive pixels. However, Wong further discloses the claimed limitation of the sampling patterns alternating per pixel for vertically-consecutive pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 12:

The claim 12 encompasses the same scope of invention as that of claim 10 except additional claimed limitation of the sampling patterns alternating per pixel for horizontally-consecutive pixels. However, Wong further discloses the claimed limitation of the sampling patterns alternating per pixel for horizontally-consecutive pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

Claim 13:

The claim 13 encompasses the same scope of invention as that of claim 10 except additional claimed limitation of the sampling patterns alternating per pixel both for horizontally-consecutive pixels and also for vertically-consecutive pixels. However, Wong further discloses the claimed limitation of the sampling patterns alternating per pixel both for horizontally-consecutive pixels and also for vertically-consecutive pixels (figures 1-5, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53).

12. Claim 23:

(1) Wong teaches a method for calculating values for pixels of an image having the pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively, comprising:

Calculating sample values for pixels of the image in accordance with a plurality of sampling rates (column 5, lines 12-67, column 6, lines 1-65); and

Calculating values for pixels of the image from a respective calculated sample values (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

- The examiner notes that at the block 542 of the flow chart in Fig. 7, Wong teaches selecting a sampling pattern from a plurality of sampling patterns shown in figures 1A-1F, 2A, 3A, 4A, 5A-5L, and two consecutive pixels with the different super-sample patterns should have different sampling rates and the sampling rate differing for at least two pixels of the image. In column 5, lines 20-24 of Wong, it is stated "FIG. 3B does not exhibit a consistent horizontal or vertical sampling frequency." Therefore, Wong fulfills claim 23.

(2) However, Wong is silent to the claim limitation of "the sampling rate differing for at least two pixels of the image".

(3) Mitchell teaches a non-uniform or adaptive sampling patterns with variations in local sampling densities for super-sampling cells or pixel regions or pixels (e.g., Mitchell page 67-68).

To illustrate how Mitchell's teaching can be used to construct the sampling rate differing for at least two pixels of the image, the Examiner wishes to explain in more detail. Mitchell

discloses each new sampling location is generated if it falls outside a certain distance of any previously chosen sampling locations in super-sampling (Mitchell page 66) and an offset can be added to the sample positions to generate new sampling pattern (Mitchell page 66). Mitchell further discloses a reconstruction filter which determines the number and locations of the sampling points and thereby determines the sampling pattern for each pixel because the filter kernel is pixel position and sampling point location dependent and the filter kernel can be constructed as an alternating function such as a sinc filter with a Hamming window (Mitchell page 67). Mitchell teaches the sampling density can be constructed to alternately change with respect to pixel positions in a way that can be determined by the filter kernel function of the pixel position or sample location and thereby alternately varying with respect to the consecutive pixel positions. Finally, by using the sampling location selection scheme or by using the alternating filter kernel, Mitchell's teaching may generate varying sampling densities such as the sampling rate differing for at least two pixels of the image.

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Mitchell's non-uniform or adaptive sampling for super-sampling cells into the Wong's invention to select sampling patterns for pixels because Wong also teaches non-uniform sampling patterns and non-uniform pixel changes and further teaches that the determination of the appropriate super-smapling pattern to use is somewhat *subjective* (e.g., Wong column 5, lines 49-67) and therefore suggesting the use of different sampling patterns for consecutive pixels. Moreover, while it is known to one of the ordinary skill in the art that super-sampling yields less aliasing,

however, Applicant apparently fails to establish the criticality of the specific way of non-uniform or adaptive sampling using two different sampling patterns for consecutive pixels.

(5) One having the ordinary skill in the art would have been motivated to do this because it would have provided a routine experimentation of the test sampling patterns to possibly reduce visible or invisible aliasing noise or to reduce signal to noise ratio by employing the different sampling patterns for the different pixels (e.g., Mitchell page 66-68, Dippe page 73-74).

Claim 24:

The claim 24 encompasses the same scope of invention as that of claim 23 except additional claimed limitation of the sampling rate alternating per pixel for consecutive pixels along lines parallel to one or the other axes of the image for at least some of the horizontal or vertical lines of pixels of the image.

However, Wong further discloses the claimed limitation of the sampling rate alternating per pixel for consecutive pixels along lines parallel to one or the other axes of the image for at least some of the horizontal or vertical lines of pixels of the image (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 25:

The claim 25 encompasses the same scope of invention as that of claim 23 except additional claimed limitation of the sampling rate being constant for the pixels arranged along any given line parallel to the first axis and varies among the plurality of sampling rates for the pixels arranged along any given line parallel to the second axis.

However, Wong further discloses the claimed limitation of the sampling rate being constant for the pixels arranged along any given line parallel to the first axis and varies among the plurality of sampling rates for the pixels arranged along any given line parallel to the second axis (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 26:

The claim 26 encompasses the same scope of invention as that of claim 25 except additional claimed limitation of the first and second sampling rates alternating per pixel for consecutive pixels in any line parallel to the second axis.

However, Wong further discloses the claimed limitation of the first and second sampling rates alternating per pixel for consecutive pixels in any line parallel to the second axis (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

13. Claim 27:

(1) Wong teaches a method for calculating values for pixels of an image having the pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with first and second sampling rates, the sampling rate remaining constant for consecutive pixels arranged along any one given line parallel to the first axis (column 5, lines 12-67, column 6, lines 1-65); and

Calculating values for pixels of the image from a respective calculated sample values (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

- The examiner notes that at 542 of Fig. 7, Wong teaches selecting a sampling pattern from a plurality of sampling patterns shown in figures 1A-1F, 2A, 3A, 4A, 5A-5L, and two consecutive pixels with the different super-sample patterns should have different sampling rates and the sampling rate differing for at least two pixels of the image. In column 5, lines 20-24 of Wong, it is stated "FIG. 3B does not exhibit a consistent horizontal or vertical sampling frequency." Therefore, Wong fulfills claim 27.

(2) However, Wong is silent to the claim limitation of "the sampling rate varying between the first and second sampling rates for consecutive pixels arranged along any one given line parallel to the second axis".

(3) Mitchell teaches a non-uniform or adaptive sampling patterns with variations in local sampling densities for super-sampling cells or pixel regions or pixels (e.g., Mitchell page 67-68).

To illustrate how Mitchell's teaching can be used to construct the sampling rate varying between the first and second sampling rates for consecutive pixels arranged along any one given line parallel to the second axis, the Examiner wishes to explain in more detail. Mitchell discloses each new sampling location is generated if it falls outside a certain distance of any previously chosen sampling locations in super-sampling (Mitchell page 66) and an offset can be added to the sample positions to generate new sampling pattern (Mitchell page 66). Mitchell further discloses a reconstruction filter which determines the number and locations of the sampling

points and thereby determines the sampling pattern for each pixel because the filter kernel is pixel position and sampling point location dependent and the filter kernel can be constructed as an alternating function such as a sinc filter with a Hamming window (Mitchell page 67). Therefore, Mitchell teaches the sampling density can be constructed to alternately change with respect to pixel positions in a way that can be determined by the filter kernel function of the pixel position or sample location alternately varying with respect to the consecutive pixel positions. Therefore, by using the sampling location selection scheme or by using the alternating filter kernel, Mitchell's teaching may generate varying sampling densities such as the sampling rate varying between the first and second sampling rates for consecutive pixels arranged along any one given line parallel to the second axis.

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Mitchell's non-uniform or adaptive sampling for super-sampling cells into the Wong's invention to select sampling patterns for pixels because Wong also teaches non-uniform sampling patterns and non-uniform pixel changes and further teaches that the determination of the appropriate super-smapling pattern to use is somewhat *subjective* (e.g., Wong column 5, lines 49-67) and therefore suggesting the use of different sampling patterns for consecutive pixels. Moreover, while it is known to one of the ordinary skill in the art that super-sampling yields less aliasing, however, Applicant apparently fails to establish the criticality of the specific way of non-uniform or adaptive sampling using two different sampling patterns for consecutive pixels.

(5) One having the ordinary skill in the art would have been motivated to do this because it would have provided a routine experimentation of the test sampling patterns to possibly reduce

visible or invisible aliasing noise or to reduce signal to noise ratio by employing the different sampling patterns for the different pixels (e.g., Mitchell page 66-68; Dippe page 73-74).

Claim 28:

The claim 28 encompasses the same scope of invention as that of claim 27 except additional claimed limitation of the pixels of the image being arranged in rows parallel to the first axis and columns parallel to the second axis, and the first and second sampling rates alternating every row of pixels. However, Wong further discloses the claimed limitation of the pixels of the image being arranged in rows parallel to the first axis and columns parallel to the second axis, and the first and second sampling rates alternating every row of pixels (figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 29:

The claim 29 encompasses the same scope of invention as that of claim 27 except additional claimed limitation of the first sampling rate being two samples per pixel and the second sampling rate being one sample per pixel. However, Wong further discloses the claimed limitation of the first sampling rate being two samples per pixel and the second sampling rate being one sample per pixel (i.e., super-sampling pattern relative to an arrangement of multiple pixels being non-uniform, see figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 30:

The claim 30 encompasses the same scope of invention as that of claim 27 except additional claimed limitation of the first sampling being two samples per pixel and the second sampling rate being one sample per pixel, the two sample locations per pixel for the first sampling rate arranged within a pixel along a line forming an acute angle with respect to either the first or second axes.

However, Wong further discloses the claimed limitation of the first sampling being two samples per pixel and the second sampling rate being one sample per pixel, the two sample locations per pixel for the first sampling rate arranged within a pixel along a line forming an acute angle with respect to either the first or second axes (i.e., super-sampling pattern relative to an arrangement of multiple pixels being non-uniform, see figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 31:

The claim 31 encompasses the same scope of invention as that of claim 27 except additional claimed limitation of the first sampling rate being two samples per pixel and the second sampling rate being one sample per pixel, the two samples per pixel for the first sampling rate arranged within a pixel substantially along and on opposite sides of a line parallel to either the first or second axes that divides the pixel in two, the axis to which the line is parallel alternating per consecutive pixel arranged along a line parallel to the first axis.

However, Wong further discloses the claimed limitation of the first sampling rate being two samples per pixel and the second sampling rate being one sample per pixel, the two samples per pixel for the first sampling rate arranged within a pixel substantially along and on opposite

sides of a line parallel to either the first or second axes that divides the pixel in two, the axis to which the line is parallel alternating per consecutive pixel arranged along a line parallel to the first axis (i.e., super-sampling pattern relative to an arrangement of multiple pixels being non-uniform, see figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 32:

The claim 32 encompasses the same scope of invention as that of claim 31 except additional claimed limitation of the two samples per pixel of the first sampling rate varying for every other consecutive pixel lying along a line parallel to the first axis between a given sampling pattern and another sampling pattern which is substantially the same pattern rotated 90 degrees.

However, Wong further discloses the claimed limitation of the two samples per pixel of the first sampling rate varying for every other consecutive pixel lying along a line parallel to the first axis between a given sampling pattern and another sampling pattern which is substantially the same pattern rotated 90 degrees (i.e., super-sampling pattern relative to an arrangement of multiple pixels being non-uniform, see figures 1-7, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

14. Claim 37:

(1) Wong teaches a method for calculating values for pixels of an image (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with a sample pattern for each pixel, each pattern having four sample locations relative to a pixel, the region of potential sampling locations considered as evenly divided into a four-by-four array of sub-regions and the four sample locations arranged in a manner whereby no two of the four sample locations from a given sampling pattern are located along the same row, column, or diagonal of sub-regions (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Determining a value for at least two pixels by combining sample values calculated for the sampling locations for the pixel (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

(2) However, Wong is silent to the claim limitation of "the sampling pattern varying per pixel between a first and a second sampling pattern".

(3) Mitchell teaches a non-uniform or adaptive sampling patterns with variations in local sampling densities for super-sampling cells or pixel regions or pixels (e.g., Mitchell page 67-68).

To illustrate how Mitchell's teaching can be used to construct the sampling pattern varying per pixel between a first and a second sampling pattern, the Examiner wishes to explain in more detail. Mitchell discloses each new sampling location is generated if it falls outside a certain distance of any previously chosen sampling locations in super-sampling (Mitchell page 66) and an offset can be added to the sample positions to generate new sampling pattern (Mitchell page 66). Mitchell further discloses a reconstruction filter which determines the number and locations of the sampling points and thereby determines the sampling pattern for each pixel because the filter kernel is pixel position and sampling point location dependent and

the filter kernel can be constructed as an alternating function such as a sinc filter with a Hamming window (Mitchell page 67). Therefore, Mitchell teaches the sampling density can be constructed to alternately change with respect to pixel positions in a way that can be determined by the filter kernel function of the pixel position or sample location alternately varying with respect to the consecutive pixel positions. Therefore, by using the sampling location selection scheme or by using the alternating filter kernel, Mitchell's teaching may generate varying sampling densities such as the sampling pattern varying per pixel between a first and a second sampling pattern.

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Mitchell's non-uniform or adaptive sampling for super-sampling cells into the Wong's invention to select sampling patterns for pixels because Wong also teaches non-uniform sampling patterns and non-uniform pixel changes and further teaches that the determination of the appropriate super-smapling pattern to use in somewhat subjective (e.g., Wong column 5, lines 49-67) and therefore suggesting two different sampling patterns can be selected for consecutive pixels. Moreover, while it is known to one of the ordinary skill in the art that super-sampling yields less aliasing, however, Applicant apparently fails to establish the criticality of the specific way of non-uniform or adaptive sampling using two different sampling patterns for consecutive pixels.

(5) One having the ordinary skill in the art would have been motivated to do this because it would have provided a routine experimentation of the test sampling patterns to possibly reduce visible or invisible aliasing noise or to reduce signal to noise ratio by employing the alternating sampling patterns for the consecutive pixels (e.g., Mitchell page 66-68; Dippe page 73-74).

Claim 38:

The claim 38 encompasses the same scope of invention as that of claim 37 except additional claimed limitation of the first and second sampling patterns alternating per consecutive pixel along at least part of at least one line parallel to a first axis of the image.

However, Wong further discloses the claimed limitation of the first and second sampling patterns alternating per consecutive pixel along at least part of at least one line parallel to a first axis of the image (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

Claim 39:

The claim 39 encompasses the same scope of invention as that of claim 38 except additional claimed limitation of the first and second sampling patterns alternating per consecutive pixel along at least part of at least one line parallel to a second axis of the image, perpendicular to the first axis.

However, Wong further discloses the claimed limitation of the first and second sampling patterns alternating per consecutive pixel along at least part of at least one line parallel to a second axis of the image, perpendicular to the first axis (figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

15. Claim 49:

(1) Wong teaches a method for calculating values for pixels of an image having pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with a plurality of sample patterns, each pixel in the image having an associated sampling pattern (figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating a final value for a pixel of the image from respective calculated sample values (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

(2) However, Wong is silent to the claim limitation of "the sampling patterns associated with the pixels of a first group of horizontally or vertically consecutive pixels being repeated for at least one following group of the same number of pixels, the same sequence of patterns appearing within at least one following group".

(3) Mitchell teaches a non-uniform or adaptive sampling patterns with variations in local sampling densities for super-sampling cells or pixel regions or pixels (e.g., Mitchell page 67-68).

To illustrate how Mitchell's teaching can be used to construct the sampling patterns associated with the pixels of a first group of horizontally or vertically consecutive pixels being repeated for at least one following group of the same number of pixels, the same sequence of patterns appearing within at least one following group, the Examiner wishes to explain in more detail. Mitchell discloses each new sampling location is generated if it falls outside a certain distance of any previously chosen sampling locations in super-sampling (Mitchell page 66) and

an offset can be added to the sample positions to generate new sampling pattern (Mitchell page 66). Mitchell further discloses a reconstruction filter which determines the number and locations of the sampling points and thereby determines the sampling pattern for each pixel because the filter kernel is pixel position and sampling point location dependent and the filter kernel can be constructed as an alternating function such as a sinc filter with a Hamming window (Mitchell page 67). Therefore, Mitchell teaches the sampling density can be constructed to alternately change with respect to pixel positions in a way that can be determined by the filter kernel function of the pixel position or sample location alternately varying with respect to the consecutive pixel positions. Therefore, by using the sampling location selection scheme or by using the alternating filter kernel, Mitchell's teaching may generate varying sampling densities such as the sampling patterns associated with the pixels of a first group of horizontally or vertically consecutive pixels being repeated for at least one following group of the same number of pixels, the same sequence of patterns appearing within at least one following group.

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Mitchell's non-uniform or adaptive sampling for super-sampling cells into the Wong's invention to select sampling patterns for pixels because Wong also teaches non-uniform sampling patterns and non-uniform pixel changes and further teaches that the determination of the appropriate super-smapling pattern to use is somewhat subjective (e.g., Wong column 5, lines 49-67) and therefore suggesting two different sampling patterns can be selected for consecutive pixels. Moreover, while it is known to one of the ordinary skill in the art that super-sampling yields less aliasing, however, Applicant apparently fails to establish the criticality of the specific way of non-uniform or adaptive sampling using two different sampling patterns for consecutive pixels.

(5) One having the ordinary skill in the art would have been motivated to do this because it would have provided a routine experimentation of the test sampling patterns to possibly reduce visible or invisible aliasing noise or to reduce signal to noise ratio by employing the alternating sampling patterns for the consecutive pixels (e.g., Mitchell page 66-68; Dippe page 73-74).

Claim 51:

Claim 51 is subject to the same rationale as claim 50 and is therefore rejected for the reasons set forth in above (see also Wong figures 5A-5L, column 4, lines 14-65, column 10, lines 23-37, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-67, column 11, lines 1-67, column 12, lines 1-56).

16. Claim 63:

(1) Wong teaches a method for calculating values for pixels of an image having pixels arranged in rows and columns parallel to first and second perpendicular axes, respectively (column 3, lines 41-67, column 4, lines 1-65), comprising:

Calculating sample values for pixels of the image in accordance with a fixed set of sampling patterns stored in a read-only memory (it is apparent that sampling patterns to be stored in a read-only memory; see a plurality of sampling patterns in figures 5A-5L, column 5, lines 12-67, column 6, lines 1-65, lines 66-67, column 7, lines 1-53, column 10, lines 23-46); and

Calculating values for pixels of the image from respective calculated sample values (column 3, lines 41-67, column 4, lines 1-65, column 6, lines 66-67, column 7, lines 1-53, column 10, lines 23-46).

(2) However, it is not clear that Wong teaches the claim limitation of "the sampling pattern for a given pixel determined by a calculation based upon the row and/or column containing the pixel".

(3) Mitchell teaches a non-uniform or adaptive sampling patterns with variations in local sampling densities for super-sampling cells or pixel regions or pixels (e.g., Mitchell page 67-68).

To illustrate how Mitchell's teaching can be used to construct the sampling pattern for a given pixel determined by a calculation based upon the row and/or column containing the pixel, the Examiner wishes to explain in more detail. Mitchell discloses each new sampling location is generated if it falls outside a certain distance of any previously chosen sampling locations in super-sampling (Mitchell page 66) and an offset can be added to the sample positions to generate new sampling pattern (Mitchell page 66). Mitchell further discloses a reconstruction filter which determines the number and locations of the sampling points and thereby determines the sampling pattern for each pixel because the filter kernel is pixel position and sampling location dependent (Mitchell page 67). Therefore, Mitchell teaches the sampling density can be constructed to change with respect to pixel positions in a way that can be determined by the filter kernel function of the pixel position. Therefore, by using the sampling location selection scheme or by the filter kernel selection, Mitchell's teaching may generate varying sampling densities such as the sampling pattern for a given pixel determined by a calculation based upon the row and/or column containing the pixel.

(4) It would have been obvious to one of ordinary skill in the art to have incorporated the Mitchell's non-uniform or adaptive sampling for super-sampling cells into the Wong's invention to select sampling patterns for pixels because Wong also teaches non-uniform sampling patterns

and non-uniform pixel changes and further teaches that the determination of the appropriate super-sampling pattern to use is somewhat subjective (e.g., Wong column 5, lines 49-67) and therefore suggesting two different sampling patterns can be selected for consecutive pixels. Moreover, while it is known to one of the ordinary skill in the art that super-sampling yields less aliasing, however, Applicant apparently fails to establish the criticality of the specific way of non-uniform or adaptive sampling using two different sampling patterns for consecutive pixels.

(5) One having the ordinary skill in the art would have been motivated to do this because it would have provided a routine experimentation of the test sampling patterns to possibly reduce visible or invisible aliasing noise or to reduce signal to noise ratio by employing the non-uniform sampling patterns for the different pixels (e.g., Mitchell page 66-68; Dippe page 73-74).

17. Claims 86:

The claim 86 encompasses the same scope of invention as set forth in claim 1 except additional claimed limitation of an apparatus for rendering of an image. However, Wong further discloses the claimed limitation of an apparatus for rendering of an image (column 3, lines 41-63).

18. Claim 91:

The claim 91 encompasses the same scope of invention as set forth in claim 27 except additional claimed limitation of an apparatus for rendering of an image. However, Wong further discloses the claimed limitation of an apparatus for rendering of an image (column 3, lines 41-63).

19. Claims 93-97:

The claim 93-97 encompasses the same scope of invention as set forth in claim 1-4 and 7 except additional claimed limitation of an apparatus for rendering of an image. However, Wong further discloses the claimed limitation of an apparatus for rendering of an image (column 3, lines 41-63).

Remarks

20. Applicant's arguments, filed 01/12/2004, paper number 11, have been fully considered but they are not deemed to be persuasive.

21. (A) In page 24-25 of the Remarks, Applicant argues in essence with respect to the Claim 1 and similar claims that:

> "One ordinarily skilled in the art, would not be motivated to combine the non-uniform sampling methods described in the Mitchell reference with the teachings of the Wong patent because the non-uniform sampling described in the Mitchell reference is contrary to using the same per pixel sampling pattern disclosed in the Wong patent. As previously discussed, the Wong patent clearly describes using the same per pixel sampling pattern for the pixels of an image."

In response to argument (A), the Examiner asserts that Wong at least suggests the non-uniform sampling methods because Wong teaches (1) a variety of different super-sampling patterns (Figures 1A-5L), (2) a flow chart describing how to determine sub-pixel locations on a per pixel basis (Figures 7-8) and thereby one of the ordinary skill in the art can change the sub-pixel parameters for each pixel (Figures 7-8) for each super-sampling pattern per pixel (Figure 10) and

thereby suggesting a different per pixel sampling pattern can be used for pixels of an image, (3) the determination of the appropriate super-sampling pattern to use being somewhat subjective (e.g., Wong column 5, lines 49-67) and thereby suggesting that the criteria for choosing a per pixel sampling pattern is somewhat subjective.

22. (B) In page 24-25 of the Remarks, Applicant argues in essence with respect to the Claim 1 and similar claims that:

> "The Mitchell reference does not teach alternating first and second sampling patterns since it discloses non-uniform sampling patterns employing Poisson-disk sampling and adaptive sampling. Neither one of these non-uniform sampling techniques would result in alternating first and second sampling patterns."

In response to argument (B), the Examiner asserts that Mitchell teaches the claim limitation of the sampling pattern for consecutive pixels alternating between a first and a second sampling pattern.

To illustrate how Mitchell's teaching can be used to construct the sampling pattern for consecutive pixels alternating between a first and a second sampling pattern, the Examiner wishes to explain in more detail. Mitchell discloses each new sampling location is generated if it falls outside a certain distance of any previously chosen sampling locations in super-sampling (Mitchell page 66) and an offset can be added to the sample positions to generate new sampling pattern (Mitchell page 66). It is conceivable that with a proper choice of the distance for rejecting

or accepting each subsequent sample location, the super-sampling patterns can be altered for consecutive pixels.

Mitchell further discloses a reconstruction filter which determines the number and locations of the sampling points and thereby determines the sampling pattern for each pixel because the filter kernel is pixel position and sampling location dependent and the filter kernel can be constructed as an alternating function such as a sinc filter with a Hamming window (Mitchell page 67). Therefore, Mitchell teaches the sampling density can be constructed to alternately change with respect to pixel positions in a way that can be determined by the filter kernel function of the pixel position or sample location alternately varying with respect to the consecutive pixel positions. Therefore, by the selection of the sampling location selection scheme or by the selection of the alternating filter kernel, Mitchell's teaching may generate varying sampling densities similar to the claim invention such as the sampling pattern for consecutive pixels alternating between a first and a second sampling pattern.

23. (C) In page 28 of the Remarks, Applicant argues in essence with respect to the Claim 14 and similar claims that:

> "Claims 14, 41...are patentably distinct from the Wong patent because the Wong patent fails to teach each limitation in the recited combination of the respective claims. For example, with respect to claim 14, which recites in pertinent part calculating pairs of sample values for pixels of the image in accordance with a plurality of sampling patterns, one sampling pattern per pixel, one pair of sampling points per sampling pattern, the

Wong patent fails to describe using a pair of sample values for the pixels of an image as recited in claim 14."

In response to argument (C), the Wong patent clearly teaches using a pair of sample values for the pixels of an image (Figure 7 wherein N=2 for 2 sampling points per pixel).

Conclusion

24. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jin-Cheng Wang whose telephone number is (703) 605-1213. The examiner can normally be reached on 8:00 - 6:30 (Mon-Thu).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Razavi can be reached on (703) 305-4713. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jcw

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